

PRELIMINARY DATA SUMMARY

April 1988

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Field Research Facility Measurement and Analysis Work Unit at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height 7.6 m above the National Geodetic Vertical Datum (NGVD). In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Herman C. Miller at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

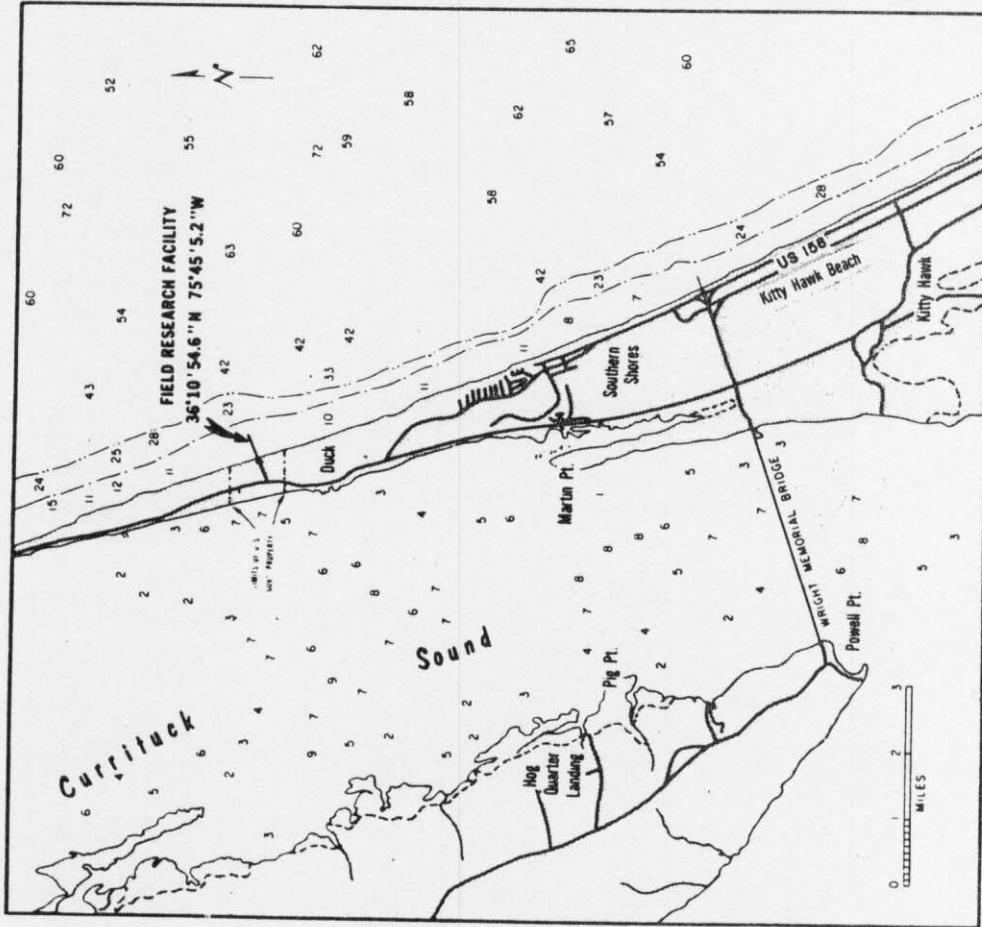
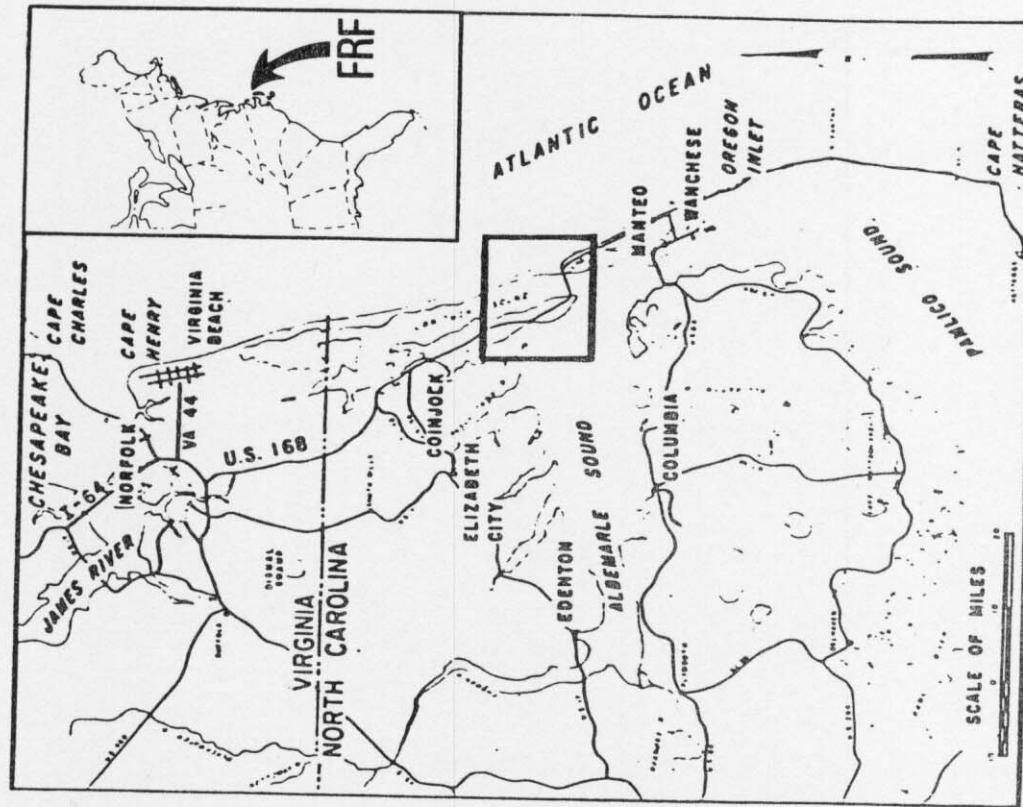


Figure 1. FRF location map

Table 1: Instrument Status/Data Availability

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Gage ID	Description/Remarks	Depth at Sensor		Day of the month																																	
				1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0				
616	Barometric Pressure		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
			Data Collected	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
604	Precipitation		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
			Data Collected	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
624	Air Temperature		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
632	Anemometer on Laboratory Building Elevation 19 m (NGVD)		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	-	-	-	-	-	-	-	-	-	-	-	-	-			
645	Baylor staff at station 7+80 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
625	Baylor staff at station 19+00 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
630	Waverider buoy 6.0 km offshore	Approx. 23 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
679	Current meter 500 m south of FRF pier (0.5 km offshore)	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Supplemental Observations (daily oceanographic and meteorological observations)		Daily observation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Gage Status	Daily Observation	Analog Record	Data Collected
Operational = *	Complete = *	Complete = *	All = *
Partial = /	Partial = /	Partial = /	Partial = /
Non-Operational = -	None = -	None = -	None = -

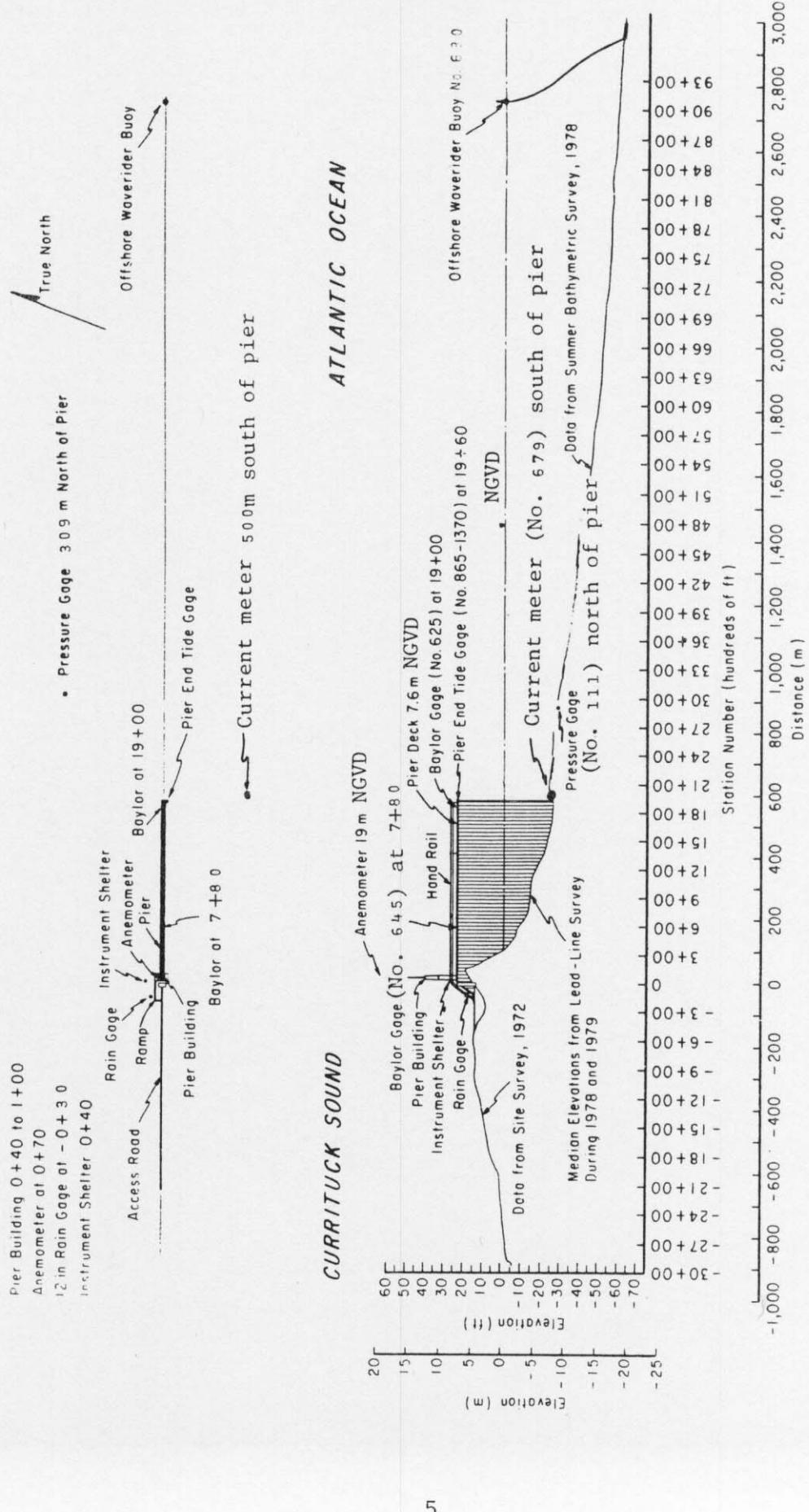


Figure 2. Instrument locations at FRF

PART II: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

Winds were measured on top of the laboratory building at an elevation of 19 m (Figure 2) using a Weather Measure Skyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Temperature and atmospheric means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in) -
 $mm \times .03937 = in$
2. Millibars (mb) to inches of mercury (in Hg) -
 $mb \times 0.02953 = in Hg$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

Table 2: Meteorological Data

APR 1988

Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
1	100	1	72	11.4	1024.0	0
	700	3	25	16.4	1024.7	0
	1300	4	48	21.8	1023.6	0
	1900	5	75	19.1	1023.3	0
2	100	4	9	17.6	1023.0	0
	700	4	22	17.5	1024.7	0
	1300	3	42	23.3	1023.6	0
	1900	5	75	19.5	1022.6	0
3	100	4	4	18.3	1022.6	0
	700	3	7	18.7	1023.3	0
	1300	7	74	23.6	1021.3	0
	1900	6	78	19.7	1018.9	0
4	100	6	84	19.1	1017.5	0
	700	5	82	19.3	1016.2	0
	1300	6	85	20.1	1012.8	0
	1900	4	85	19.8	1010.8	0
5	100	6	31	17.8	1010.1	0
	700	5	8	17.5	1012.5	0
	1300	4	37	16.0	1014.2	0
	1900	3	34	15.2	1013.5	0
6	100	6	97	16.5	1012.8	0
	700	5	88	18.7	1011.4	0
	1300	6	79	26.9	1006.4	0
	1900	8	70	21.3	1001.0	0
7	100	6	58	16.7	996.2	7
	700	9	62	11.7	994.9	23
	1300	Preventive Maintenance			992.1	0
	1900	5	75	13.9	995.2	0
8	100	8	30	11.1	996.2	0
	700	15	4	9.2	1000.6	0
	1300	10	58	10.0	1004.0	0
	1900	10	42	10.8	1006.4	0
9	100	12	45	9.9	1008.1	0
	700	10	44	8.9	1010.1	0
	1300	6	20	10.6	1012.1	0
	1900	1	54	10.5	1012.1	0
10	100	5	93	10.2	1012.1	0
	700	10	49	8.8	1013.1	0
	1300	9	18	10.7	1012.1	0
	1900	3	86	9.8	1011.8	0
11	100	4	15	9.9	1011.1	0
	700	3	31	11.3	1011.4	0
	1300	5	63	12.0	1011.1	0
	1900	8	59	9.9	1011.8	0
12	100	9	61	9.0	1012.8	0
	700	11	57	9.0	1011.8	0
	1300	16	56	9.8	1007.0	0
	1900	19	46	9.7	1006.0	10
13	100	17	42	9.7	1004.3	0
	700	21	33	9.7	1001.0	0
	1300	21	69	9.0	1003.0	19
	1900	19	10	8.0	1008.4	18
14	100	15	13	7.4	1011.4	0
	700	11	7	7.8	1015.2	0
	1300	7	3	9.5	1017.2	0
	1900	5	91	8.0	1016.2	0
15	100	4	56	7.9	1015.9	0
	700	6	85	12.1	1013.8	0
	1300	3	31	19.1	1011.1	0
	1900	8	90	16.2	1008.7	0
16	100	12	14	9.9	1012.1	0
	700	8	3	8.7	1015.9	0
	1300	6	50	13.2	1015.5	0
	1900	4	33	13.0	1014.2	0

(Continued)

(Sheet 1 of 2)

Table 2: Meteorological Data

APR 1988

Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
17	100	4	41	8.6	1018.2	0
	700	4	32	10.7	1018.6	0
	1300				1016.5	0
	1900		Software Error		1011.4	0
18	100				1009.1	0
	700	10	8	16.8	1005.7	0
	1300	12	32	21.8	1002.0	0
	1900	9	31	19.1	999.9	0
19	100	5	15	14.9	1004.0	0
	700	10	50	9.3	1004.0	8
	1300	19	1	7.6	1000.3	7
	1900	5	29	6.6	1005.7	4
20	100	6	87	6.5	1010.8	0
	700	5	2	7.3	1014.8	0
	1300	5	3	13.3	1013.1	0
	1900	6	86	12.2	1010.4	0
21	100	8	15	12.7	1007.4	0
	700	9	34	13.7	1004.0	0
	1300	8	44	21.8	1001.3	0
	1900	5	37	12.1	1004.7	0
22	100	4	36	11.0	1008.7	0
	700	6	61	10.0	1011.4	0
	1300	3	88	12.6	1011.4	0
	1900	4	99	10.6	1011.8	0
23	100	7	3	11.1	1014.2	0
	700	6	84	11.9	1014.8	0
	1300	4	30	14.7	1011.1	0
	1900	3	1	19.3	1006.7	0
24	100	4	13	17.6	1004.0	6
	700	8	25	18.4	1004.0	0
	1300	8	37	22.6	1003.0	0
	1900	6	35	13.4	1007.7	0
25	100	9	23	11.2	1011.8	0
	700	6	39	11.2	1014.8	0
	1300	3	69	12.9	1014.2	0
	1900	4	11	11.1	1012.8	0
26	100	2	42	11.2	1012.8	0
	700	6	42	12.4	1012.8	0
	1300	9	57	13.4	1011.8	0
	1900	4	62	13.2	1010.4	0
27	100	3	4	12.7	1011.1	0
	700	2	8	14.0	1012.5	0
	1300	4	8	18.9	1011.1	0
	1900	5	73	17.9	1007.4	0
28	100	4	84	16.0	1007.0	0
	700	8	35	13.9	1007.0	0
	1300	7	63	16.8	1007.7	0
	1900	9	91	13.9	1009.1	0
29	100	9	76	10.2	1010.4	0
	700	9	68	11.1	1010.8	0
	1300	9	80	16.3	1010.1	0
	1900	3	94	14.9	1010.1	0
30	100	5	82	13.1	1009.4	0
	700	7	94	13.7	1012.8	0
	1300	8	33	14.1	1015.9	0
	1900	5	23	12.2	1017.2	0
		Resultant 7	44	Mean 13.6	Mean 1010.8	Total 102

(Sheet 2 of 2)

PART I I: WAVE DATA

Wave data are collected from two Baylor staff gages (Gages 625 and 645), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 6 hrs (more frequently during storms) near 0100, 0700, 1300, and 1900 EST. The sampling rate is two times per second for 34 minutes.

Wave height H_{mo} is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period T_p is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to magnetic tape.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all H_{mo} and T_p values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, or the presence of multiple wave trains containing nearly equal energy.

Table 3: Wave Data

Apr 1988

Day	Hour	645		625		111		630	
		Baylor at 7+80 Hmo,m	T,sec	Baylor at 19+00 Hmo,m	T,sec	Pressure Gage Hmo,m	T,sec	Farshr Wvrdr Hmo,m	T,sec
1	0100	0.70	12.80	0.86	9.14	0.87	12.19	0.91	9.14
	0700	0.54	12.19	0.84	11.64	0.87	12.19	0.82	8.53
	1300	0.55	11.64	0.76	11.64	0.83	11.13	0.85	11.13
	1900	0.60	10.67	0.88	11.13	0.95	10.67	0.99	10.67
2	0100	0.62	11.13	0.92	11.13	0.94	10.67	0.90	11.13
	0700	0.52	10.67	0.87	10.67	0.92	10.67	0.88	10.24
	1300	0.48	10.67	0.77	10.67	0.85	10.24	0.91	9.85
	1900	0.53	10.67	0.80	9.48	0.85	10.24	0.83	10.24
3	0100	0.47	10.24	0.72	10.67	0.72	10.67	0.82	9.48
	0700	0.47	10.67	0.74	10.67	0.82	10.67	0.83	10.24
	1300	0.47	10.24	0.73	10.67	0.75	10.24	0.85	9.85
	1900	0.47	10.24	0.73	10.24	0.73	10.67	0.89	10.67
4	0100	0.41	9.85	0.62	9.48	0.72	9.85	0.84	10.24
	0700	0.48	9.48	0.71	9.85	0.77	9.85	0.95	6.24
	1300	0.44	9.48	0.59	10.24	0.64	9.85	0.79	9.14
	1900	0.46	6.56	0.63	9.48	0.67	9.48	0.82	6.56
5	0100	0.36	7.11	0.49	9.14	0.54	9.85	0.69	9.14
	0700	0.35	8.83	0.50	6.40	0.55	8.53	0.66	9.48
	1300	0.29	9.85	0.41	9.14	0.51	9.48	0.54	9.48
	1900	0.29	9.48	0.50	9.48	0.50	9.14	0.58	9.85
6	0100	0.29	9.85	0.46	9.85	0.49	9.85	0.49	9.48
	0700	0.30	9.48	0.44	9.48	0.50	9.48	0.54	10.24
	1300	0.37	10.67	0.51	10.67	0.50	10.24	0.60	11.13
	1900	0.42	11.13	0.60	10.67	0.64	10.24	0.82	4.06
7	0100	0.41	6.40	0.59	5.95	0.64	11.13	0.86	6.40
	0700	0.65	7.31	0.85	7.31	0.87	7.31	1.14	7.31
	1300	Preventive Maintenance							
	1900	0.87	6.56	0.93	12.19	1.07	6.40	1.26	6.92
8	0100	1.26	7.53	1.19	7.31	1.40	7.53	1.42	8.00
	0700	1.54	8.00	2.66	8.83	3.03	8.26	3.01	7.31
	1300	1.61	8.83	2.05	8.83	2.36	9.48	2.38	8.26
	1900	1.35	8.26	1.96	8.83	2.10	9.48	2.08	8.83
9	0100	1.68	9.85	2.27	9.48	2.35	9.85	2.51	9.48
	0700	1.34	10.24	2.04	10.24	2.13	9.48	2.33	10.24
	1300	1.42	10.67	1.88	10.67	1.89	10.24	2.03	10.24
	1900	1.30	10.67	1.66	10.67	1.64	10.67	1.59	10.24
10	0100	0.99	10.67	1.35	10.67	1.38	10.24	1.31	10.24
	0700	1.18	9.85	1.59	9.85	1.59	10.67	1.71	9.48
	1300	1.32	5.69	1.57	10.24	1.65	10.24	1.64	10.24
	1900	0.98	9.85	1.23	10.24	1.27	9.85	1.23	9.85
11	0100	0.67	9.85	0.94	9.48	1.03	9.85	1.03	9.85
	0700	0.61	9.48	0.82	9.14	0.97	9.85	0.84	9.14
	1300	0.60	8.83	0.86	9.48	0.94	9.14	0.85	9.14
	1900	0.73	9.48	0.99	10.24	1.04	9.85	0.99	10.24
12	0100	0.95	4.49	1.41	10.24	1.36	9.14	1.48	10.24
	0700	1.28	5.12	1.65	10.67	1.80	5.45	1.80	10.24
	1300	1.51	6.74	2.37	6.09	2.48	6.40	2.58	6.56
	1900	1.55	7.11	2.70	6.92	3.07	6.56	3.19	7.31
13	0100	1.60	9.14	2.96	8.26	3.68	8.26	3.68	8.26
	0700	1.83	8.53	3.10	10.24	4.34	8.53	3.98	8.83
	1300	1.77	10.67	3.17	12.19	4.81	10.24	4.96	9.85
	1900	1.89	10.67	3.37	11.13	4.44	9.85	4.39	8.26
14	0100	1.50	9.48	2.84	11.64	3.73	11.64	3.42	9.85
	0700	1.72	11.13	2.64	12.19	2.88	11.13	2.72	12.19
	1300	1.54	9.85	2.10	11.64	2.33	10.67	2.33	10.67
	1900	1.29	10.67	1.85	9.85	2.11	11.13	1.93	9.85
15	0100	1.21	10.67	1.66	10.67	1.91	10.24	1.88	10.67
	0700	0.71	10.67	1.49	9.85	1.51	10.24	1.40	9.85
	1300	0.81	10.24	1.16	9.85	1.27	9.85	1.30	9.14
	1900	0.54	9.85	0.96	9.48	1.06	9.48	1.12	9.14
16	0100	0.92	3.94	1.19	10.67	1.41	9.48	1.37	9.85
	0700	1.25	5.82	1.32	5.82	1.45	5.95	1.62	5.69
	1300	1.12	5.82	0.98	6.24	1.10	5.95	1.13	5.82
	1900	0.70	5.82	0.81	13.47	0.85	5.82	0.96	13.47

* Electronic problems

(Continued)

(Sheet 1 of 2)

Table 3: Wave Data

Apr 1988

Day	Hour	645		625		111		630	
		Baylor	at 7+80	Baylor	at 19+00	Pressure Gage		Farshr	Wvrdr
		Hmo,m	T.sec	Hmo,m	T.sec	Hmo,m	T.sec	Hmo,m	T.sec
17	0100	0.70	5.12	0.67	13.47	0.74	12.80	0.79	12.80
	0700	0.37	5.22	0.55	12.80	0.61	12.80	0.65	12.80
	1300								
	1900								
		Software Error							
18	0100								
	0700	0.26	11.64	0.31	12.19	0.31	12.19	0.50	11.64
	1300	0.31	2.75	0.38	11.64	0.39	12.19	0.72	3.88
	1900	0.26	13.47	0.36	15.06	0.43	13.47	0.68	2.54
19	0100	0.31	13.47	0.45	12.80	0.53	13.47	0.62	14.22
	0700	0.71	3.56	0.87	3.77	0.81	3.66	0.94	3.77
	1300	1.18	5.02	1.53	4.74	1.60	4.66	1.75	5.02
	1900	1.51	6.92	1.71	6.92	1.75	7.53	1.96	7.31
20	0100	1.01	6.56	1.12	7.53	1.22	7.31	1.31	7.31
	0700	0.69	5.45	0.77	6.40	0.88	14.22	0.95	6.24
	1300	0.45	15.06	0.62	16.00	0.74	17.07	0.75	16.00
	1900	0.50	15.06	0.77	15.06	0.85	16.00	0.92	16.00
21	0100	0.34	16.00	0.62	17.07	0.66	16.00	0.73	16.00
	0700	0.27	16.00	0.50	15.06	0.58	15.06	0.75	15.06
	1300	0.30	16.00	0.51	15.06	0.66	15.06	0.63	15.06
	1900	0.41	16.00	0.53	16.00	0.60	16.00	0.64	16.00
22	0100	0.29	15.06	0.50	16.00	0.57	15.06	0.67	16.00
	0700	0.51	15.06	0.68	15.06	0.61	14.22	0.78	3.41
	1300	0.55	5.33	0.70	15.06	0.67	15.06	0.75	5.12
	1900	0.47	6.40	0.63	6.74	0.63	6.56	0.73	6.40
23	0100	0.54	3.82	0.76	15.06	0.70	15.06	0.81	14.22
	0700	0.42	5.22	0.61	15.06	0.65	15.06	0.73	14.22
	1300	0.39	4.92	0.65	14.22	0.68	14.22	0.79	4.83
	1900	0.49	6.09	0.81	6.09	0.82	5.95	1.13	6.40
24	0100	0.47	6.74	0.77	6.56	0.82	6.92	1.04	7.11
	0700	0.35	7.11	0.58	7.31	0.62	6.92	0.91	7.31
	1300	0.25	7.76	0.44	7.53	0.51	8.26	0.65	7.11
	1900	0.51	3.24	0.61	3.20	0.57	3.33	0.77	3.37
25	0100	0.54	4.34	0.70	4.13	0.73	3.88	0.87	4.27
	0700	0.70	4.74	0.75	5.02	0.76	4.74	0.96	4.66
	1300	0.59	4.92	0.65	4.66	0.70	4.83	0.77	4.83
	1900	0.39	4.49	0.49	12.80	0.50	12.80	0.53	6.40
26	0100	0.28	5.33	0.42	15.06	0.45	14.22	0.50	5.22
	0700	0.23	15.06	0.36	15.06	0.41	13.47	0.41	14.22
	1300	0.60	3.61	0.82	4.34	0.75	3.61	0.90	4.27
	1900	0.51	5.57	0.87	5.22	0.86	5.12	1.01	5.12
27	0100	0.48	6.56	0.82	6.40	0.96	6.40	1.06	6.74
	0700	0.44	6.74	0.82	6.56	0.79	6.40	0.92	6.09
	1300	0.36	6.24	0.66	6.56	0.71	6.24	0.82	6.56
	1900	0.39	7.53	0.62	6.92	0.71	6.74	0.88	7.31
28	0100	0.34	7.53	0.66	7.11	0.73	6.92	0.92	7.11
	0700	0.45	2.81	0.75	7.11	0.66	6.74	0.98	7.31
	1300	0.35	7.11	0.64	7.11	0.66	7.11	0.74	7.31
	1900	0.32	9.14	0.59	7.31	0.59	7.53	0.77	7.11
29	0100	0.36	9.48	0.56	8.83	0.64	8.83	0.73	9.14
	0700	0.21	9.14	0.45	9.48	0.48	8.83	0.60	9.14
	1300	0.29	9.48	0.43	8.53	0.43	8.53	0.58	9.85
	1900	0.22	8.83	0.36	9.48	0.40	8.53	0.49	9.85
30	0100	0.23	3.33	0.39	9.85	0.41	10.24	0.50	5.95
	0700	0.20	7.53	0.33	9.48	0.36	9.85	0.50	9.48
	1300	0.80	4.57	0.74	4.66	0.81	4.34	0.91	4.57
	1900	0.38	5.33	0.46	10.24	0.49	9.85	0.66	5.22
	Mean	0.70	8.60	1.01	9.83	1.12	9.69	1.20	8.86
	Std dev	0.45	3.19	0.69	3.05	0.88	3.02	0.84	3.04

* Electronic problems

(Sheet 2 of 2)

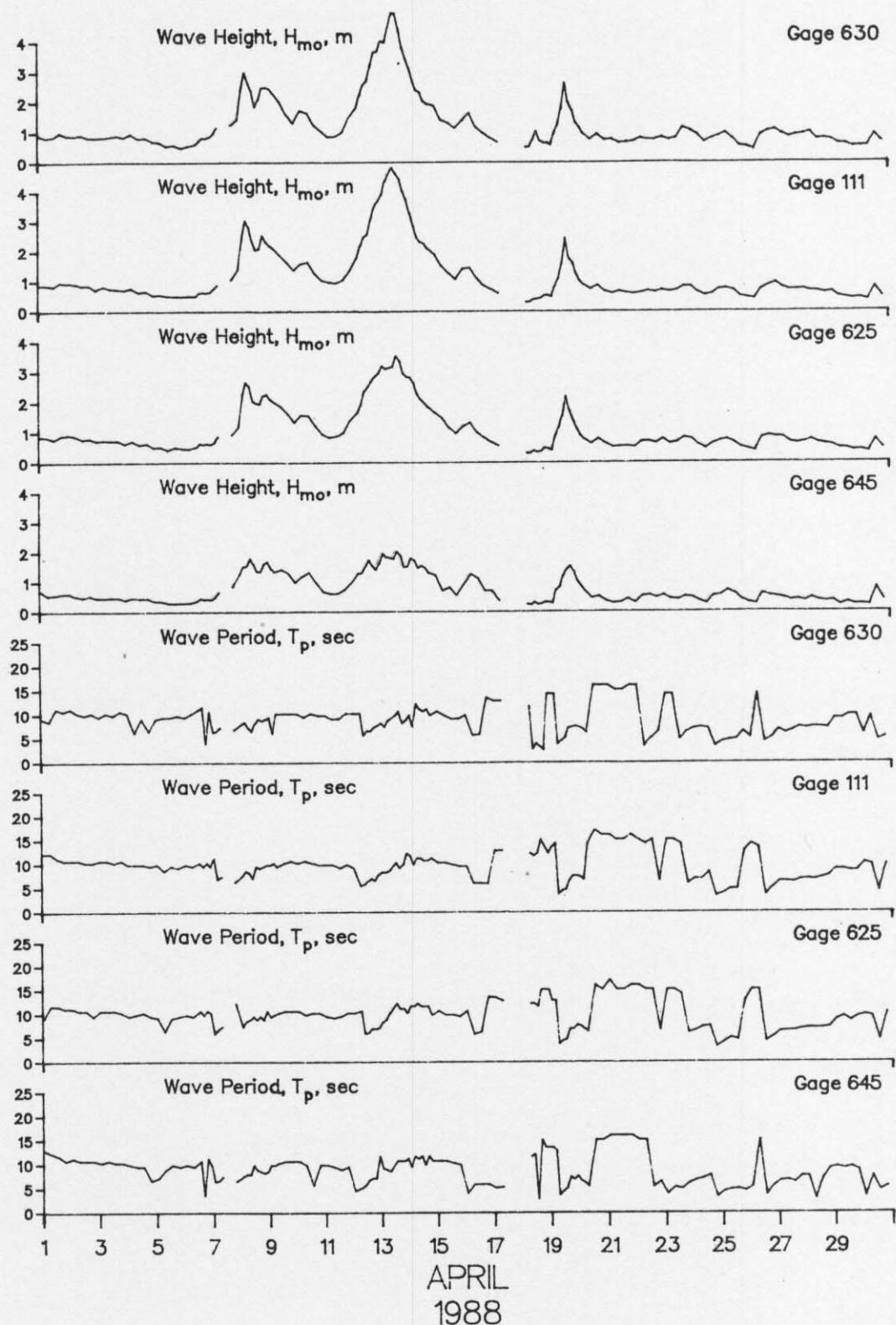


Figure 3. Time history of wave heights and periods

PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the data.

Table 4: Current Data
Apr 1988

Day	Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679	
		Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Speed
1	0100-Along Cross Result									12
										S
	0700-Along Cross Result	4 S	152	15	S		26 N			12
		3 off		33	off	North				17
		5 129		37	94					115
	1300-Along Cross Result									7
										0
	1900-Along Cross Result									7
										160
	0100-Along Cross Result									4
										4
	0700-Along Cross Result	8 N	152	36	N		26			6
		9 off		11	off	South				115
		12 30		37	357					17
	1300-Along Cross Result									2
										on
	1900-Along Cross Result									17
	0100-Along Cross Result									167
										9
	0700-Along Cross Result									3
										off
										142
	1300-Along Cross Result									1
										3
	1900-Along Cross Result									3
										88
	0100-Along Cross Result									1
										N
	0700-Along Cross Result	4 S	152	24	S		26			1
		0		24	off	North				off
		4 160		34	115					115
	1300-Along Cross Result									1
										N
	1900-Along Cross Result									3
										on
	0100-Along Cross Result									3
										268
	0700-Along Cross Result									4
										N
										5
	1300-Along Cross Result									on
										6
	1900-Along Cross Result									289
										N
	0100-Along Cross Result									9
										on
	0700-Along Cross Result	25 N	152	51	N		37 N			4
		0		0		South				146
		25 340		51	340					1
	1300-Along Cross Result									3
										off
	1900-Along Cross Result									115
										1
	0100-Along Cross Result									N
										3
	0700-Along Cross Result	23 S	140	29	N		15 S			4
		0		0		South				on
		23 160		29	340					4
	1300-Along Cross Result									284
										3
	1900-Along Cross Result									on
										4
	0100-Along Cross Result									2
										3
	0700-Along Cross Result	23 S	140	29	N		15 S			4
		0		0		South				on
		23 160		29	340					4
	1300-Along Cross Result									326
										8
	1900-Along Cross Result									6
										off
										10
										123
										3
										2
										on
										4
										306

KEY = All speeds in CM/SEC
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data
Apr 1988

Alongshore Cross-shore Resultant Time Day	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679	
	Dye at (579 m) (surface) Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface) Location	Speed	Dir	Speed	Dir	
6 0100-Along Cross Result									2	S	
6 0700-Along Cross Result	25 8 27	N off 357	140	61 18 64	N off 357	41	N		1	on	
6 1300-Along Cross Result									2	187	
6 1900-Along Cross Result									4	N	
7 0100-Along Cross Result									0		
7 0700-Along Cross Result	10 14 17	S off 106	140	68 10 68	N on 331	46	N		5	on	
7 1300-Along Cross Result									5	250	
7 1900-Along Cross Result									1	S	
8 0100-Along Cross Result									3	on	
8 0700-Along Cross Result	102 0 102	S off 160	152	122 18 123	S on 169	no observation			3	232	
8 1300-Along Cross Result									12	S	
8 1900-Along Cross Result									12	off	
9 0100-Along Cross Result									17	115	
9 0700-Along Cross Result	87 0 87	S off 160	152	122 0 122	S off 160	39	S		47	S	
9 1300-Along Cross Result						North			11	off	
9 1900-Along Cross Result									48	147	
10 0100-Along Cross Result									69	S	
10 0700-Along Cross Result	61 18 64	S on 177	152	87 0 87	S off 160	34	S		12	off	
10 1300-Along Cross Result						North			70	150	
10 1900-Along Cross Result									37	S	
									5	off	
									37	152	
									34	S	
									5	off	
									34	152	
									45	S	
									8	off	
									46	150	
									29	S	
									4	off	
									29	152	
									27	S	
									1	off	
									27	158	
									14	S	
									1	on	
									14	164	
									10	S	
									0		
									10	160	
									28	S	
									5	off	
									28	150	
									22	S	
									3	off	
									22	152	
									19	S	
									2	off	
									19	154	

KEY = All speeds in CM/SEC
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data
Apr 1988

Day	Time	Pier Measurements				Beach Measurements			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679	
		Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface) Location	Speed	Dir
11	0100-Along Cross Result								5	S
11	0700-Along Cross Result	23 9 24	S on 182		152 0 322	76 84	S	North	27	N
11	1300-Along Cross Result								8 3 9	S off 139
11	1900-Along Cross Result								19 4 19	S off 148
12	0100-Along Cross Result								11 3 11	S off 145
12	0700-Along Cross Result	24 7 25	S on 177		152	76 0 82	S North	9	N	14 4 15
12	1300-Along Cross Result								21 7 2	S off 97
12	1900-Along Cross Result								22 50 13	142
13	0100-Along Cross Result								52 20 59	S off 140
13	0700-Along Cross Result	122 0 122	S on 160		140	122 61 136	S on 187	no observation		77 26 81
13	1300-Along Cross Result								82 34 89	S off 137
13	1900-Along Cross Result								84 28 89	S off 142
14	0100-Along Cross Result								52 17 55	S off 142
14	0700-Along Cross Result	68 0 68	S on 160		140	87 44 97	S on 187	no observation		40 8 41
14	1300-Along Cross Result								18 1 18	S on 163
14	1900-Along Cross Result								17 3 17	S off 150
15	0100-Along Cross Result								3 3 4	S off 115
15	0700-Along Cross Result	30 15 34	N off 7		152	61 30 68	N off 7	no observation		14 4 15
15	1300-Along Cross Result								9 2 9	N on 327
15	1900-Along Cross Result								5 4 6	N on 301

KEY = All speeds in CM/SEC

N = Northward, Shore parallel

S = Southward, Shore parallel

on = onshore off = offshore

Table 4: Current Data
Apr 1988

Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter at South Tripod				
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD)	ID #679
Day													
16 0100-Along Cross Result										18	S		
										3	off		
										18	151		
16 0700-Along Cross Result	38	S		68	S			42	S	22	S		
	0			61	on					4	off		
	38	160		91	202					22	150		
16 1300-Along Cross Result										7	S		
										4	off		
										8	130		
16 1900-Along Cross Result										3	S		
										2	on		
										4	194		
17 0100-Along Cross Result										9	S		
										3	off		
										9	142		
17 0700-Along Cross Result	0			0				42		1	N		
	0			0						0			
	0	0		0	0					1	340		
17 1300-Along Cross Result													
17 1900-Along Cross Result												Software Error	
18 0100-Along Cross Result													
18 0700-Along Cross Result	30	N		23	N			13	N	13	N		
	9	off		7	off					4	on		
	32	357		24	357					14	323		
18 1300-Along Cross Result										7	N		
										5	on		
										9	304		
18 1900-Along Cross Result										11	N		
										5	on		
										12	316		
19 0100-Along Cross Result										1	S		
										1	on		
										1	205		
19 0700-Along Cross Result	4	S		29	S			15	S	6	S		
	3	on		3	on					1	off		
	5	195		29	166					6	151		
19 1300-Along Cross Result										33	S		
										5	off		
										33	151		
19 1900-Along Cross Result										25	S		
										1	off		
										25	158		
20 0100-Along Cross Result										13	S		
										0			
										13	160		
20 0700-Along Cross Result	30	S		102	N			15	S	5	S		
	0			56	on					0			
	30	160		116	9					5	160		
20 1300-Along Cross Result										14	S		
										5	off		
										15	140		
20 1900-Along Cross Result										2	N		
										2	340		

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Table 4: Current Data
Apr 1988

Day	Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679		
		Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed
21	0100-Along Cross Result										6
											N
											6
											on
											8
											295
21	0700-Along Cross Result	36	N			152	24	N		South	3
		0					7	off			20
		36	340				25	357			7
											on
											21
											321
21	1300-Along Cross Result										10
											N
											7
											on
											12
											305
21	1900-Along Cross Result										10
											N
											1
											off
											10
											346
22	0100-Along Cross Result										4
											N
											0
											4
											340
22	0700-Along Cross Result	0				152	18	N		South	15
		4	on				4	off			2
		4	250				18	351			0
											2
											340
22	1300-Along Cross Result										5
											S
											1
											off
											5
											149
22	1900-Along Cross Result										5
											N
											1
											on
											5
											329
23	0100-Along Cross Result										14
											N
											1
											on
											14
											336
23	0700-Along Cross Result	12	N			152	28	N		South	24
		0					4	off			8
		12	340				28	349			0
											8
											340
23	1300-Along Cross Result										4
											S
											1
											on
											4
											174
23	1900-Along Cross Result										15
											S
											0
											15
											160
24	0100-Along Cross Result										6
											S
											1
											on
											6
											169
24	0700-Along Cross Result	0				152	22	N		South	13
		15	off				0				0
		15	70				22	340			5
											on
											250
24	1300-Along Cross Result										0
											5
											on
											5
											250
24	1900-Along Cross Result										14
											S
											1
											off
											14
											156
25	0100-Along Cross Result										10
											S
											3
											off
											10
											143
25	0700-Along Cross Result	38	S			152	51	S		North	53
		0					13	off			12
		38	160				52	146			3
											off
											146
25	1300-Along Cross Result										8
											5
											off
											9
											128
25	1900-Along Cross Result										0
											1
											on
											250

KEY = All speeds in CM/SEC
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data
Apr 1988

Alongshore Cross-shore Resultant ---- Time	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter at South Tripod Depth -4.8m (NGVD) ID #679		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
Day											
26 0100-Along Cross Result										8	N
26 0700-Along Cross Result	5 5 7	S on 206		11 5 12	S on 184			2	North	2	N
26 1300-Along Cross Result										1	off
26 1900-Along Cross Result										2	7
27 0100-Along Cross Result										9	S
27 0700-Along Cross Result	38 10 39	S on 174		36 11 37	N off 357			32	South	0	off
27 1300-Along Cross Result										4	70
27 1900-Along Cross Result										10	149
28 0100-Along Cross Result										0	
28 0700-Along Cross Result	19 1 19	S off 157		27 1 27	S on 163			32	N	6	S
28 1300-Along Cross Result										1	on
28 1900-Along Cross Result										11	165
29 0100-Along Cross Result										1	
29 0700-Along Cross Result	14 11 18	S off 123		17 5 18	S off 143			11	North	1	S
29 1300-Along Cross Result										2	on
29 1900-Along Cross Result										2	223
30 0100-Along Cross Result										5	
30 0700-Along Cross Result	16 0 16	S off 160		18 6 19	S off 143			37	North	2	on
30 1300-Along Cross Result										5	250
30 1900-Along Cross Result										4	182

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on = onshore off = offshore

PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) taken at the seaward end of the pier are made of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves). The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are made daily at the seaward end of the FRF pier. A jar along with a thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The jar is removed, the temperature read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the surface visibility.

Table 5: Supplemental Observations

Apr 1988

Day	Time	Wave Approach		Radar Wave Angle deg from True N	Width of Surf Zone,m	Water Characteristics at Pier End		
		Primary	Secondary			Temp.,C	Density g/cc	Secchi Vis.,m
1	1715	40	90	inoperative	60	10.6	1.0250	4.9
2	0628	70		inoperative	91	11.0	1.0246	3.0
3	0900	85	150	inoperative	49	11.4	1.0242	2.4
4	1044	90	150	inoperative	15	11.1	1.0258	2.7
5	0849	100			47	10.0	1.0260	3.7
6	0800	90			46	9.5	1.0258	3.7
7	0705	100	40		72	8.1	1.0260	3.0
8	0715	40		50	502	11.1	1.0236	0.3
9	0740	10	345	60	274	9.4	1.0240	0.9
10	0720	50	345	60	61	9.7	1.0234	0.6
11	0723	100	40		101	10.9	1.0222	1.2
12	0700	60	80	80	256	10.9	1.0224	0.3
13	0941	40	80	50	660	11.1	1.0218	0.3
14	0747	40	90	60	366	9.5	1.0244	0.3
15	0706	40	100	70	134	10.0	1.0244	0.3
16	0730	20		80	107	9.7	1.0248	0.6
17	0715	70			21	9.4	1.0242	0.9
18	0640	120	20		165	8.6	1.0244	0.9
19	0725	30	85		85	10.0	1.0250	0.3
20	0931	60	30		76	10.0	1.0248	0.6
21	0816	70	50		76	10.6	1.0249	0.9
22	0715	90	60	80	67	10.1	1.0250	0.9
23	0730	80		80	67	10.8	1.0252	0.9
24	0800	150	40		76	11.4	1.0248	0.9
25	0650	80	30		82	11.1	1.0245	1.5
26	0640	none visible			52	12.2	1.0242	1.8
27	0910	110			78	13.9	1.0224	2.7
28	0700	90	20	90	81	12.2	1.0236	1.5
29	0616	none visible			59	12.5	1.0234	0.9
30	0900	345		80	6	13.0	1.0232	1.5

PART VI: WATER LEVELS

The National Ocean Services (NOS) has established a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect data every 6 minutes throughout the month.

Figure 4 shows the variation in mean water levels computed over a tidal cycle period (12.42 hours) and contains a list of selected mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water levels.

Table 6 contains the time of the center of each sampling interval and the range, high, low, and mean water levels during each tidal cycle.

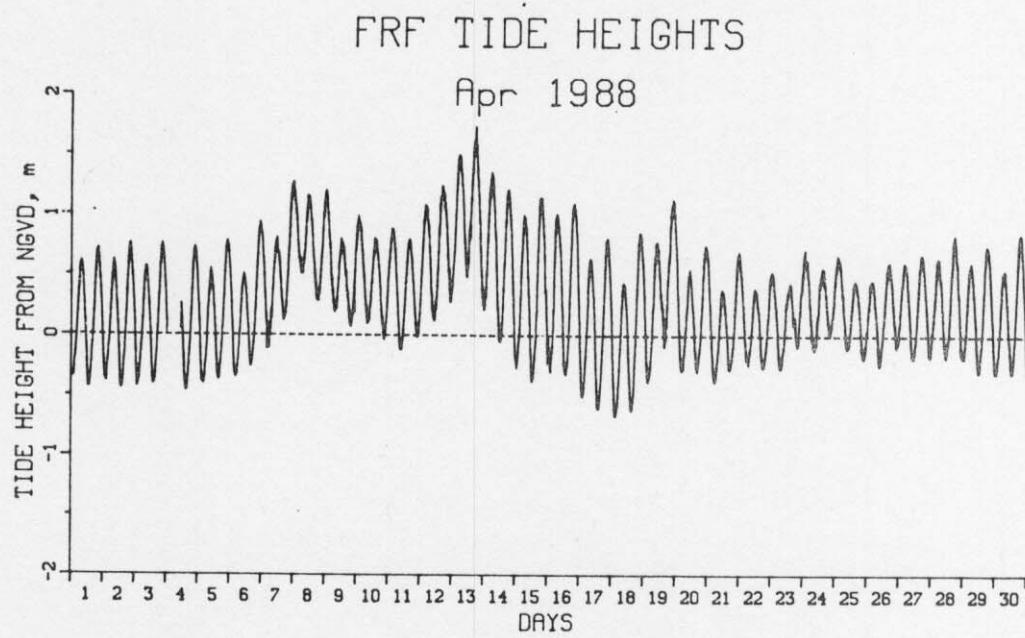


Figure 4. Time history of mean water levels

Monthly Water Levels, m NGVD

Extreme Low	=	-0.66 on day 18 at 212 hr
Extreme High	=	1.73 on day 13 at 1706 hr
Monthly Mean	=	0.31
Mean Low	=	-0.22
Mean High	=	0.81
Mean Range	=	1.03

Table 6: Water Levels, m NGVD

		Apr 1988			
Day	Mid-Cycle Time	Low	High	Mean	Range
1	612	-0.43	0.61	0.10	1.04
1	1837	-0.43	0.72	0.16	1.15
2	703	-0.44	0.62	0.09	1.06
2	1928	-0.43	0.76	0.17	1.19
3	753	-0.41	0.57	0.07	0.97
3	2018				
4	843				
4	2109	-0.42	0.73	0.16	1.16
5	934	-0.40	0.55	0.05	0.95
5	2159	-0.34	0.79	0.23	1.13
6	1024	-0.33	0.51	0.09	0.84
6	2249	-0.13	0.94	0.42	1.08
7	1115	-0.10	0.81	0.41	0.91
7	2340	0.19	1.27	0.82	1.09
8	1205	0.29	1.16	0.75	0.87
9	30	0.21	1.20	0.73	0.99
9	1255	0.07	0.80	0.45	0.73
10	121	0.10	0.99	0.55	0.90
10	1346	0.01	0.81	0.42	0.80
11	211	-0.11	0.89	0.43	0.99
11	1436	-0.12	0.80	0.36	0.91
12	301	-0.01	1.09	0.58	1.10
12	1527	0.12	1.24	0.75	1.12
13	352	0.28	1.50	0.94	1.23
13	1617	0.33	1.73	1.05	1.41
14	442	-0.01	1.36	0.72	1.37
14	1707	-0.18	1.22	0.55	1.40
15	532	-0.38	1.00	0.33	1.38
15	1758	-0.37	1.15	0.41	1.51
16	623	-0.30	1.01	0.34	1.31
16	1848	-0.43	1.10	0.38	1.53
17	713	-0.60	0.64	0.03	1.24
17	1938	-0.62	0.81	0.12	1.42
18	804	-0.66	0.44	-0.11	1.11
18	2029	-0.62	0.85	0.19	1.47
19	854	-0.38	0.78	0.26	1.16
19	2119	-0.22	1.13	0.53	1.35
20	944	-0.29	0.55	0.09	0.84
20	2210	-0.34	0.75	0.24	1.09
21	1035	-0.38	0.39	-0.01	0.77
21	2300	-0.27	0.69	0.22	0.97
22	1125	-0.26	0.40	0.06	0.66
22	2350	-0.26	0.53	0.15	0.79
23	1216	-0.27	0.44	0.12	0.70
24	41	-0.09	0.71	0.31	0.80
24	1306	-0.11	0.56	0.23	0.67
25	131	-0.05	0.67	0.33	0.72
25	1356	-0.14	0.46	0.17	0.60
26	222	-0.20	0.46	0.14	0.66
26	1447	-0.24	0.61	0.23	0.86
27	312	-0.15	0.61	0.24	0.76
27	1537	-0.18	0.68	0.25	0.86
28	402	-0.17	0.65	0.22	0.82
28	1628	-0.18	0.84	0.31	1.01
29	453	-0.30	0.61	0.18	0.91
29	1718	-0.30	0.75	0.24	1.05
30	543	-0.30	0.55	0.10	0.85
30	1808	-0.31	0.85	0.29	1.16

PART VII: EARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Zeiss surveying system; a Zeiss Elta-2 first-order, self-recording electronic theodolite distance meter in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in March and the two surveys in April on profile line 188, located 517 m south of the pier. Following a significant Northeaster on 12-14 April, the foreshore accreted slightly (70 to 140 m) and the nearshore bar migrated 20 m seaward (160 to 280 m). Only minor changes are visible on the remainder of the profile.

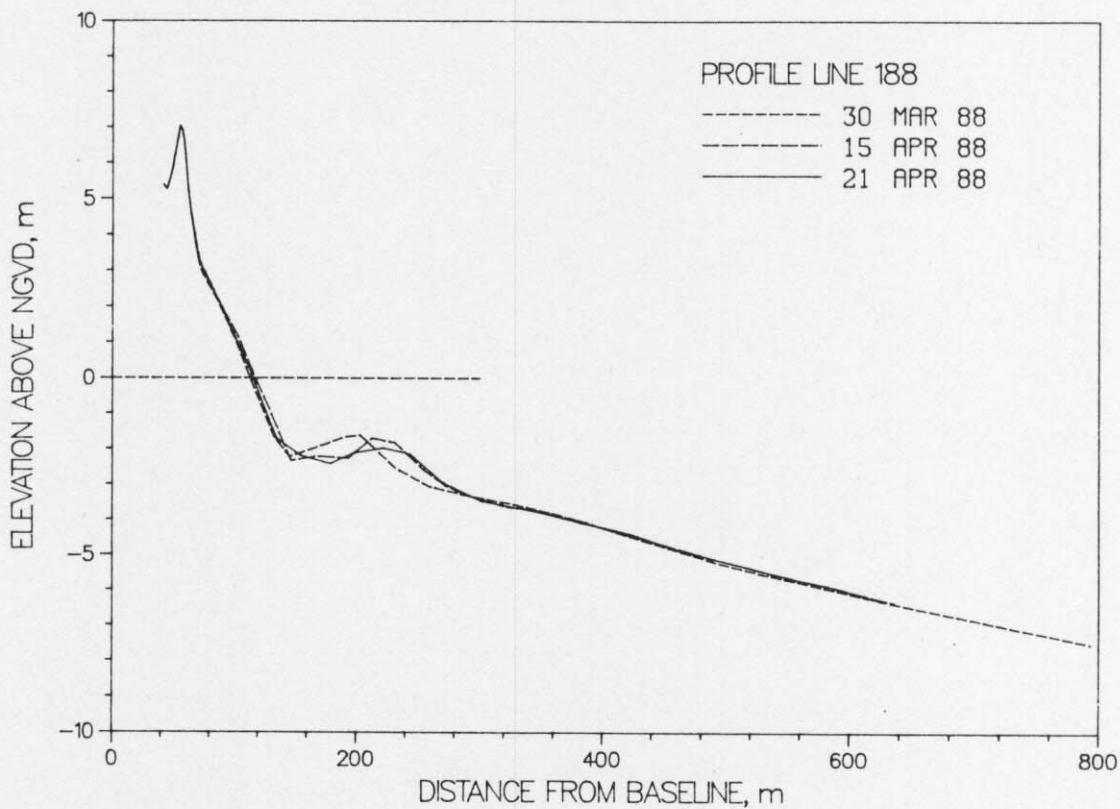


Figure 5. Monthly CRAB profiles on profile 188 - 517 m south of pier.

The profile envelope (Figure 6) reflects the maximum changes that occurred on the profile during 1988. The two most prominent changes document the accretion on the foreshore and the seaward movement of the nearshore bar following the storm.

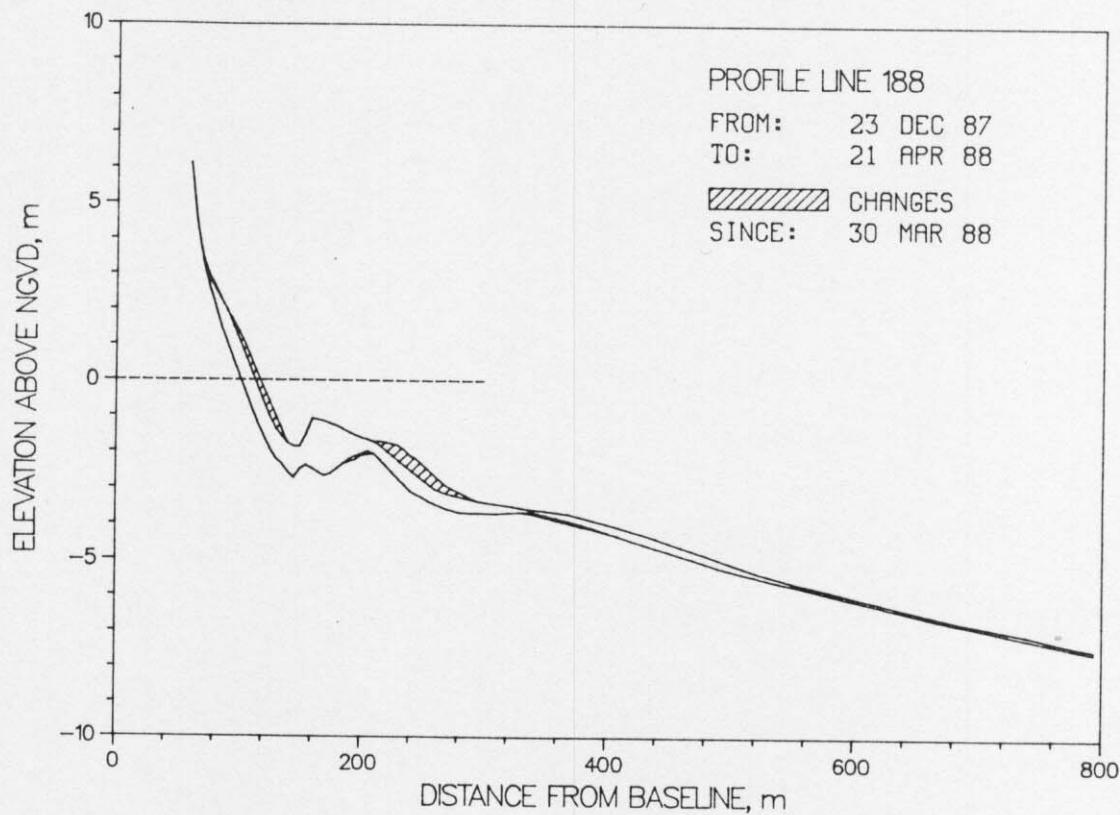


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey conducted during the month. Wide contour lines on the change diagram represent areas which eroded; thin lines indicate accretion.

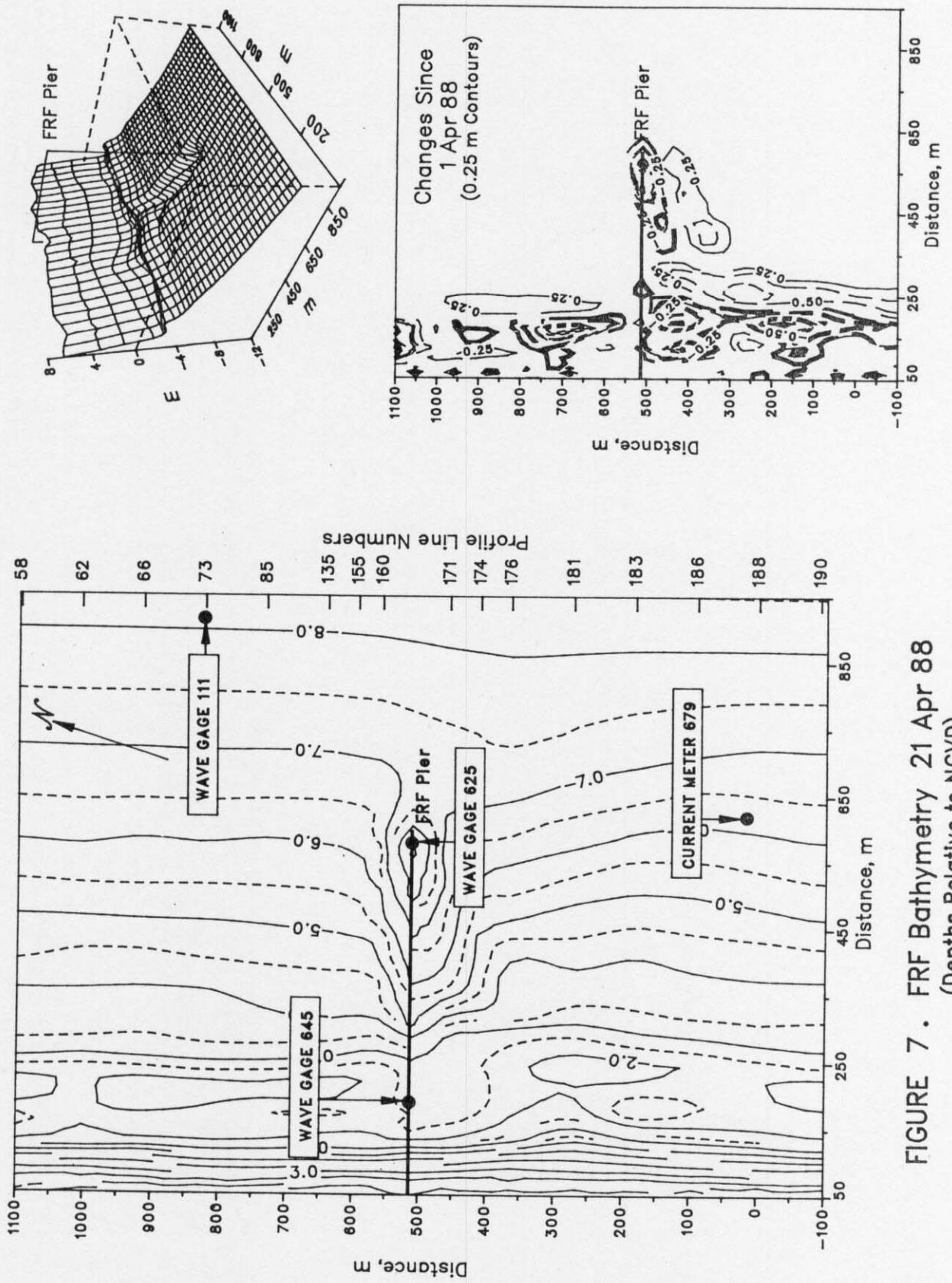


FIGURE 7. FRF Bathymetry 21 Apr 88
(Depths Relative to NGVD)

PART VIII: SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when the wave height at the seaward end of the pier (i.e. as measured by Gage 625 at pier station 19+00) exceeded 2 m. When this occurred, four contiguous 34-min wave records were obtained every three hours:

<u>Start</u>	<u>End</u>
8 Apr (0242)	9 Apr (0808)
12 Apr (1034)	14 Apr (1442)
19 Apr (1408)	19 Apr (1708)

B. Storm Synopsis.

8 April - This storm formed over the southwestern U.S. on 30 March and slowly strengthened as it approached the Great Lakes. It dropped to the SE passing over the Virginia coast early on 8 April and rapidly moved into the Atlantic. On 8 April at 0734 hr, the maximum wind speeds (from north) neared 16 m/s and the maximum H_{mo} was 2.8 m ($T_p = 9.85$ sec). The minimum barometric pressure of 994.7 mb occurred early on 7 April. Precipitation amounted to 30 mm.

12-14 April - After forming over the Gulf of Mexico on 10 April, this storm continued to strengthen as it tracked across the southeast. By 12 April, it was still well inland over Alabama; however, strong onshore winds were being generated at the FRF. As it continued to intensify, the storm's forward movement slowed, finally moving offshore at Cape Hatteras, NC on 13 April. This Northeaster caused coastal erosion (resulting in the demise of several beach cottages) and flooding at a number of locations along the Outer Banks. Peak winds (from northeast) exceeded 21 m/s early on 13 April with winds above 15 m/s continuing for 37 hours. The minimum barometric pressure (1001.0 mb) occurred at 0700 hr on 13 April and the maximum H_{mo} of 4.96 m ($T_p = 10.24$ sec) at Gage 630 occurred several hours later. Total precipitation was 47 mm.

19 April - This weak low pressure system began as a cold front over Louisiana on 18 April, rapidly moved to the northeast, and by 20 April moved well offshore. Maximum winds (from north) exceeded 19 m/s on the afternoon of the 19th while the maximum H_{mo} of 2.17 m ($T_p = 6.92$ sec) was attained several hours later. The minimum barometric pressure was 1000.8 mb and precipitation totaled 19 mm.

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